REMARKS

Claims 1-27 are pending in this application.

Claims 1- 27 are rejected.

In the office action dated July 17, 2002 and made final, claims 1-17 and 26-27 are rejected under 35 USC §102(b) as being anticipated by Levran et al. (U.S. Patent No. 5,047,910), and claims 18-25 are rejected under 35 USC §103(a) as being unpatentable over Gunnarsson (U.S. Patent No. 6,115,269) in view of Bhattacharya et al (U.S. Patent No. 5,513,090). These rejections are respectfully traversed.

'102 rejection

Claims 1-17 recite a power distribution system including an ac source connected to a power bus, capacitors shunt connected to the power bus, and an active filter shunt connected to a power bus. The active filter injects harmonic currents into the power bus. Claims 26-27 recite a method including injecting harmonics into a power bus.

Levran et al. appear to show an inverter 1 that is operated as a dc-ac converter (by a controller 4), a power bus coupled to the inverter 1, and capacitors C1-C3 shunt connected to a power bus. However, Levran et al. don't disclose an active filter that injects harmonic currents into the power bus in order to achieve sinusoidal voltages. Even if the inverter 1 is characterized as an ac-source, Levran et al. still don't disclose an inverter-based active filter.

The office action does not respond to this argument. It does not disclose where Levran et al. show an active filter that is shunt connected to a power bus and that injects harmonic currents into the power bus in order to achieve

sinusoidal voltages. The office action merely states the circuit structure of the applicants' Figure 2 is similar to Levran et al.'s figure 1 and col. 2, lines 55-60 and col. 3, lines 1-20.

Similarity between two figures does not provide a basis for a '102 rejection. The cited document must disclose each limitation of the claimed invention. If it does not, the '102 rejection should be withdrawn.

Figure 1 and col. 2, lines 55-60 and col. 3, lines 1-20 of Levran merely disclose an inverter 1 that is coupled between a dc source and an ac power bus. The inverter generates an approximate sinusoidal output voltage (col. 2, lines 36-40). The inverter 1 is not shunt connected to the power line. The inverter 1 does not inject harmonic currents in order to achieve sinusoidal voltages.

Levran et al. disclose a filter that is shunt connected to each phase of the power bus. The filter is designed to filter out harmonic voltages (col. 1, lines 20-24). Each filter includes an inductor, resistive and capacitor (col. 2, lines 55-61). None of the filters include an inverter.

Thus Levran et al. do not teach or suggest an active filter that that is shunt-connected to a power bus and that injects harmonic currents into the power bus in order to achieve sinusoidal voltages. Accordingly, claim 1 and its dependent claims 2-17 should be allowed over Levran et al. Claims 26-27 should be allowed over Levran et al. for the same reason.

'103 rejection

Replacement claim 18 recites an active filter including an inverter; means for generating a plurality of different voltage commands, each voltage command corresponding to a different harmonic current; means for summing the different voltage commands with a voltage command representing inverter voltage; and means, responsive to the summing means, for controlling the inverter. The inverter is controlled to function as a current controlled-current source that injects harmonic currents into the power bus such that the voltage on the power bus contains only a fundamental component.

Gunnarsson appears to disclose a system for reducing harmonics from a high voltage dc link, but does not disclose the claimed technique for controlling an inverter to inject harmonic currents into the power bus.

Bhattacharya et al. discloses a "hybrid series active, parallel passive power line conditioner including a series transformer 42, a series inverter 34, a series inverter controller 70, and a passive filter 72 (see Fig. 7). The passive filter 72 absorbs all harmonic currents generated by the non-linear load (col. 10, lines 20-22). The active filter injects harmonic voltages that are summed by the transformer with the utility source such that ideally only the fundamental and no harmonic currents will flow through the transformer 42. Thus the injection of the harmonic voltage is controlled such that the voltage of the filtered harmonic generator and the voltage at the terminals of the transformer are ideally identical. Resulting is an effective high impedance that stops harmonic currents from being injected into the utility source.

The office action states that Figure 1 of the instant application clearly matches with a passage on col. 3, lines 60-70+ of Bhattacharya et al. This

argument is not relevant, since Figure 1 of the instant application does not show the claimed features of the active filter.

The cited passage in Bhattacharya et al. merely states that a passive filter absorbs all harmonic currents generated by the non-linear load, while the series active filter is controlled to force all load harmonics into the passive filter, thereby achieving harmonic isolation between the load and the supply. This harmonic isolation, as described by Bhattacharya et al., refers to the way that the transformer and the series active filter adjust the impedance between the utility and the harmonic load. The operation of the active rectifier/transformer is such that the impedance is very low at the fundamental frequency (60 Hz) for a conventional utility, but is high at the harmonic frequencies. This causes the harmonic currents generated by the non-linear load to circulate between the load and the passive filter (see Fig. 7), and does not allow them to appear on the distribution system. The transformer essentially adds a harmonic voltage to the utility so that the voltages at the non-linear load and the transformer match one another.

Thus the active filter of Bhattacharya et al. operates as a current controlled harmonic voltage source (col. 6, line 2). The active filter only provides fundamental current to the transformer primary while only injecting harmonic voltages (col. 9, line 4). The active filter superimposes harmonic voltages to effectively create a high impedance for those currents. The high impedance prevents the harmonic currents from entering the transformer.

In contrast, the active filter of claim 18 operates as a current controlled harmonic current source. The active filter supplies only harmonic currents to the distribution system, while creating only a fundamental voltage at the terminals. Harmonic currents are already circulating in the system due to a harmonic

generator (e.g., an ac source). In this manner the active filter improves power quality.

Because Bhattacharya et al. do not teach or suggest the claimed techniques for controlling an inverter to inject harmonic currents into the power bus, the '103 rejection of claim 18 should be withdrawn.

Claims 19-25 recite an active filter including an inverter and a plurality of control loops. Each loop corresponds to a different multiple of capacitor bank Park Vector angle. Each control loop causes the inverter to inject a different harmonic current into the power bus. Bhattacharya et al. do not teach or suggest a plurality of control loops, each loop corresponding to a different multiple of capacitor bank Park Vector angle, each control loop causing the inverter to inject a different harmonic current into the power bus. Therefore, the '103 rejections of claims 19-25 should be withdrawn.

The examiner is respectfully requested to withdraw the rejections of the claims and issue a notice of allowability. If any issues remain, the examiner is invited to contact the undersigned.

Respectfully submitted,

Hugh P. Gortler
Reg. No. 33,890

I hereby certify that this correspondence is being facsimile transmitted to the United States Patent and Trademark Office on October 10, 2002.

Hugh P. Gortler

Honeywell International Inc.
Law Department, AB2
P.O. Box 2245
Morristown, NJ 07962-9806
(310) 512-4885

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

18. An active filter for a power distribution system, the system including a power bus, the filter comprising:

an inverter;

means for generating a plurality of different voltage commands, each voltage command corresponding to a different harmonic current;

means for summing the different voltage commands with a voltage command representing inverter voltage; and

means, responsive to the summing means, for controlling the inverter to function as a current controlled-current source that injects harmonic currents into the power bus such that the voltage on the power bus contains only a fundamental component.